Name: _____ Period: _____ Date: _____ EN : _____

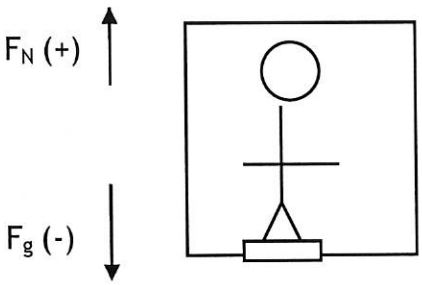
ELEVATOR LAB

Newton's 2nd law :

F_g is negative and the force exerted by the elevator F_N is positive.

F_N is your "apparent weight" measured by the scale you will be standing on while the elevator accelerates.

Since there are only 2 forces acting in the elevator, the net force, SF is just the vector sum of the 2 forces.



$$SF = F_N + F_g$$

If acceleration is upwards, SF = (+)
If acceleration is downwards, SF = (-)

OBJECTIVE : Determine the acceleration of an elevator using a bathroom scale.
MATERIALS: Bathroom scale, elevator NOTE: Digital Scales will probably not work!

PROCEDURE:

1) Determine your actual weight by standing on a bathroom scale and Record .
   a) convert pounds to kilograms by using the conversion 2.2 LB = 1 kg.
   b) calculate the weight in Newtons by multiplying your mass in kg by 9.8 N/kg, Record

2) While standing on the scale in an elevator, press the up button. Have your partner ready to read the maximum weight attained just as the elevator accelerates. Do 3 trials and take the average. Convert to Newtons. Record the data in the "up/start" column.

3) When the elevator approaches the next stop, have your partner read the scale just as the elevator decelerates to a stop. Determine the minimum weight attained while decelerating. Do 3 trials and average. Convert to Newtons. Record the data in the "up/stop" column.

4) While standing on the scale in an elevator, press the down button. Have your partner ready to read the minimum weight attained just as the elevator accelerates. Do 3 trials and take the average. Convert to Newtons. Record the data in the "down-start" column.

5) When the elevator approaches the next stop, have your partner read the scale just as the elevator decelerates to a stop. Determine the maximum weight attained while decelerating. Do 3 trials and average. Convert to Newtons. Record the data in the "down/stop" column.

*** Be sure to express forces and weights with the appropriate signs, + for up and - for down.

6) $SF = F_N + F_g$ Take your values for F_N and F_g to obtain your SF values. (this should be equal to the difference in your "weights" as measured by the scale)

7) Then, take your SF values, divide them by your mass, and obtain the acceleration rate of the elevator for each part of your journey.

DATA AND CALCULATIONS:
(note: the answers for chart row 1 are the same for all 4 columns; this also applies for data chart row 2 and row 3)

	UP/START	UP/STOP	DOWN/START	DOWN/STOP
1) Actual Weight (LB)				
2) Mass (kg) 2.2 LB = 1 kg.				
3) F_g (N) Mass (kg) x 9.8 m/s^2				
4) F_N (Lb) Trial 1				
Trial 2				
Trial 3				
Average F_N (Lb)				
5) Average F_N (N)				
6) SF (N) (# 5 - # 3)				
7) Acceleration = SF/m (#6/#2)				

TRENDS:

Draw Free Body Diagrams

a) Elevator is Stopped ____ N reading	b) Elevator going up ____ N reading	c) Elevator going down ____ N reading
Explain the ____ N reading	Explain the ____ N reading	Explain the ____ N reading

Questions:

1. In order for an object to accelerate, there must be a :

2. True or False: The direction of acceleration will be the same direction as the Net Force.

3. How does the acceleration you experience in an elevator compare to that you might experience in a car that accelerates from 0 to 60 miles per hour in 7 seconds? (Remember to express accelerations in m/s^2; 60 miles/hr = 26.8 m/s)

2. Show some proof of your adventure; a photo of you on an elevator, or a video on "youtube", or some physical evidence of your experiments.

3. Create a scenario that shows how you would teach this lesson about apparent weight to an audience. Identify the audience: adults, 1st graders. Remember to include what you think their MISCONCEPTION(S) would be. Try to be creative and have some fun!